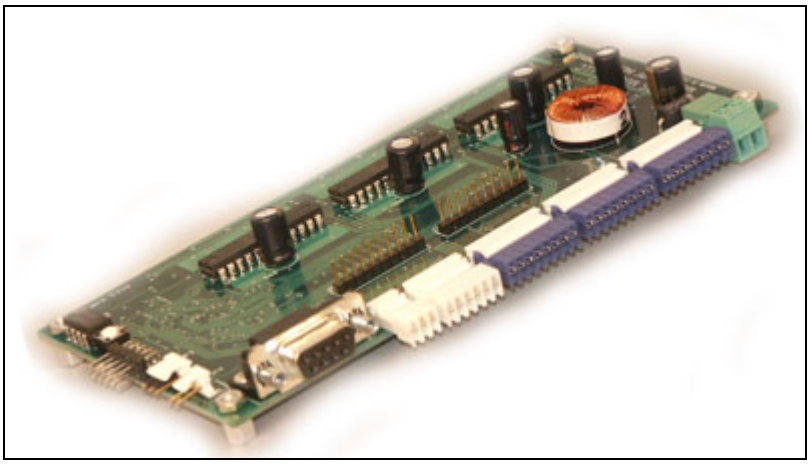
R364 3-Axis Controller / Driver



User Manual - 1 of 2
Reference Guide

Version 2.34

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Thank you for purchasing the R364 3-Axis Controller/Driver. This product is warranted to be free of manufacturing defects for one year from the date of purchase.

Technical Support for Lin Engineering, a distributor of RMS Technologies
By Telephone: 408-919-0200
(Mon.-Fri., 8:00 a.m.-5:00 p.m.)
On the Web: www.linengineering.com
Our technical support group is glad to work with you in answering your questions. If you cannot find the solution to your particular application, or, if for any reason you need additional technical assistance, please call technical support at **408-919-0200**.

PLEASE READ BEFORE USING

Before you start, you must have a suitable step motor, a DC power supply suitable for the motor. The power supply voltage must be between 4 times and 20 times the motor's rated voltage.

DISCLAIMER

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R364 User Manual

Product: R364
Version: 2.34
Date: 1/22/2008

Version History		
Version	**Date**	**Description of Changes**
2.32	09/27/2006	Old user manual
2.33	02/28/2007	Standardization of user manuals
2.34	01/22/2008	Updated typographical errors

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1. FEATURES

- 3-Axis Step Motor Controller and Driver PCB
- Control up to three 2-Phase step motors
- Operates from +15 to 48 VDC at up to 4.5 Amps
- Phase currents between 0.2 to 1.5 Amp/Phase (Software Programmable)
- Step profiles - Trapezoidal, Velocity, Smooth Stop
- Up to 15.6 kHz Full Step Frequency (All motors moving)
- Full Step, Half Step, 1/4, 1/8, 1/16, 1/32, and 1/64 step resolution
- Three level smart current control– Accelerating/Decelerating, Constant Speed, Zero Speed
- Operating modes - Host Control or Joystick
- Command format - ASCII Character Strings
- All configuration parameters and a script of up to 1,750 commands
- Limit switches - Left and Right switch inputs for all motors
- Home reference - Commanded automatic sequence for each motor. The Left Limit Switch is found. The motor then moves to a user given offset position, and then sets the current position to be zero.
- Analog/Digital Inputs - Eight inputs 0 to 5 VDC analog, or eight inputs TTL digital
- Digital Outputs - Seven open-collector relay or solenoid drivers, and one TTL output
- Stores parameters such as current, microstep, top speed in a non-volatile memory location

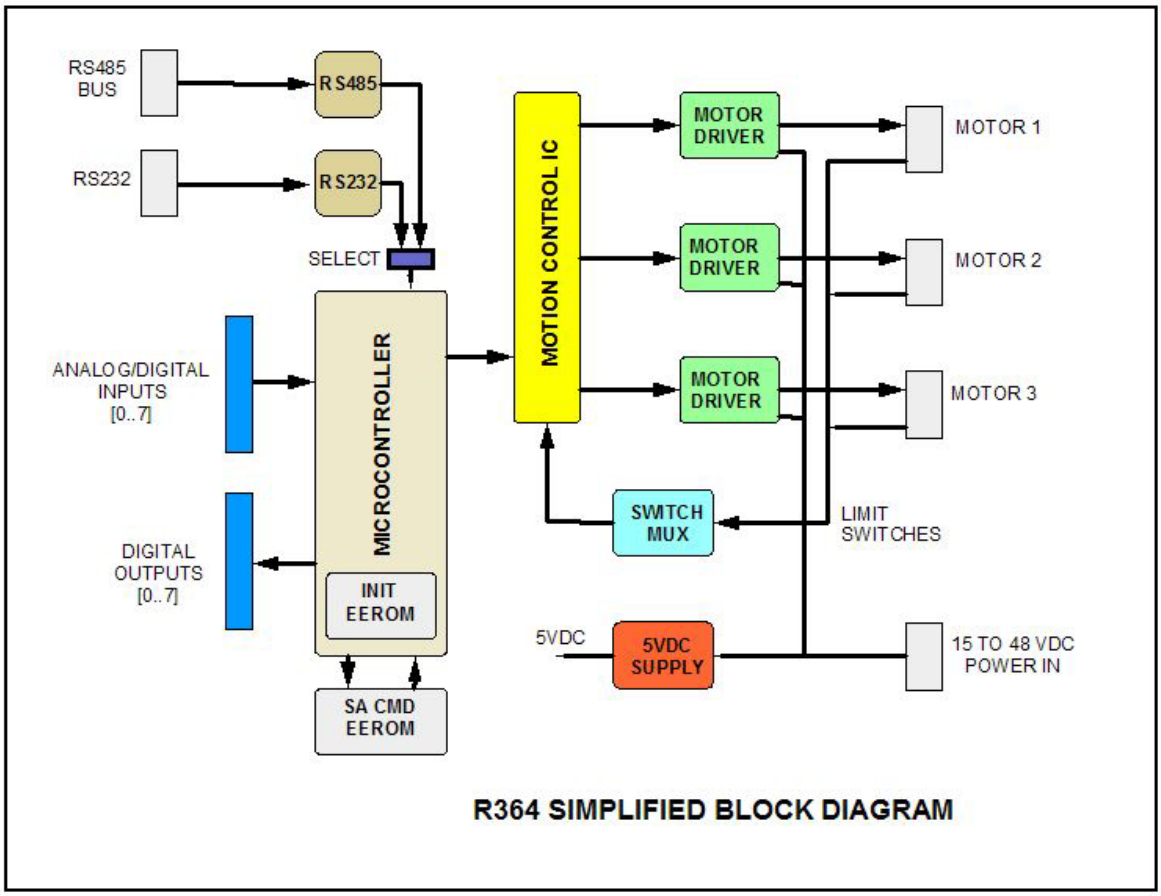


Figure 1: R364 Simplified Block Diagram

2. ELECTRICAL SPECIFICATIONS

Supply Voltage: +15 to 48 VDC @ up to 4.5 Amps
Peak Current: 0.2 to 1.5 Amps for each axis (Software Programmable)

Main Power – The lower limit of 15V is set by the driver IC ratings. The on-board voltage regulator determines the upper limit of 48V. The maximum current draw with all three motors shutdown (zero current) is less than 100 mA

I/O Specifications

Analog/Digital Inputs:	Eight inputs 0 to 5 VDC analog, or eight inputs TTL Digital
Digital Outputs:	Seven open-collector relay or solenoid drivers, and one TTL output

Limit Switches

There are left and right limit switches for each axis. The limit switches must be pulled to ground in order to begin using the axes. Motors will not respond to moves if limit switches are high.

3. OPERATING SPECIFICATIONS

Maximum Step Frequency	Up to 15.6 kHz Full Step frequency (all motors moving)
Operating Temperature	0° to 50° Celsius (ambient)

4. COMMUNICATION SPECIFICATIONS

Both RS232 and RS485 are supported, but only one can be used at a time. Address bytes in the RS485 commands allow multiple units (30 axis max) to be controlled from a single host port.

Interface Type	RS232 or RS485
Baud Rate	Standard rates in the range 9600 to 57600 bits per second
# Bits per character	8 data bits
Parity	None
Stop Bit	2
Flow Control	None

Note: JP4 must be switched to the corresponding communication specification (either RS232 or RS485). When using RS485 with multiple modules, be sure to terminate the last board using a jumper on JP5.

JP4 needs to have a jumper on Pins 1 & 2 if you are communicating via RS485. JP4 needs to have a jumper on Pins 2 & 3 if you are communicating via RS232.

5. MECHANICAL SPECIFICATIONS

Size & Weight: 3.209” x 6.398” (81.50 mm x 162.50 mm), 3.6 oz (100 gm)
Mounting: Four #6-32 screws, 2.700” x 6.100” (68.58 mm x 154.94 mm)

Connectors

1. RS232 is a DB9 female connector. A DB-9 to DB-9, male to female cable is required to plug this into a PC
2. RS485, SA CTL & Fault (stand-alone control), Motors 1, 2, 3 are IDC (insulation displacement connector) Pin headers with 0.1” (2.54 mm) pin to pin pitch. Use AMP part number 770602-XX, where the XX stands for the # of pinouts. For motor connectors there are 8 pins so part number is 770602-8.
3. Power is a 3.81 mm Pluggable Terminal.
4. Digital outputs and digital/analog inputs (J6 and J7) use an AMP part number 770602-10 for the connector and 770666-1 for the pins.
5. A jumper is provided for the RS232/485 selection, but no jumper is provided in the RS485 Terminal. If you only have one unit, no jumper is needed. If you have multiple units, a jumper will be needed on the last module.

Dimensions

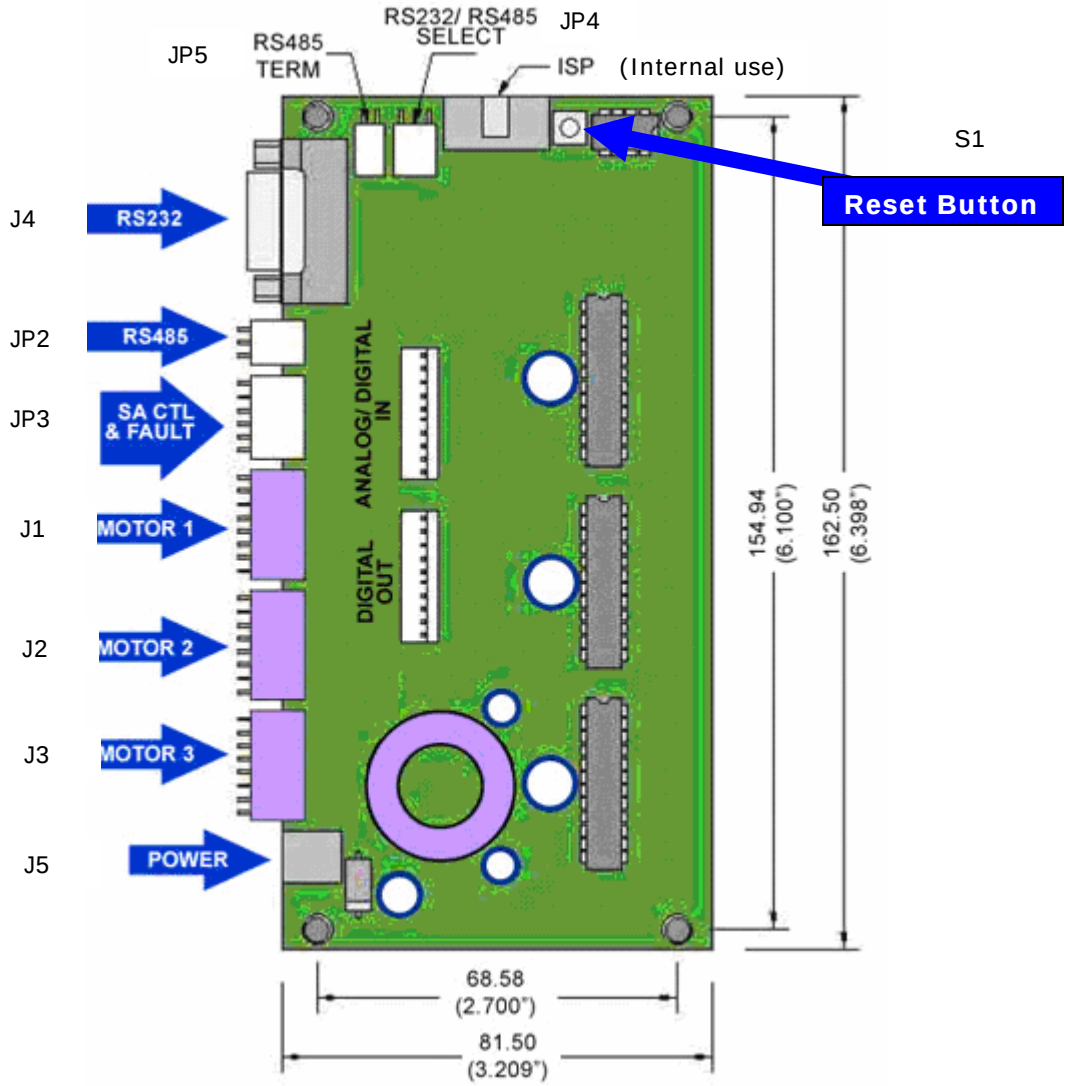


Figure 2: Dimensions Diagram

6. PIN ASSIGNMENTS

Main Power – The lower limit of 15V is set by the driver IC ratings. The on-board voltage regulator determines the upper limit of 48V. The maximum current draw with all three motors shutdown (zero current) is less than 100 mA

CON J5	Ref.	Function
1	GND	Power Return
2	VDD	Main Power (15 to 48 VDC)

RS232 – The baud rate for either RS232 or RS485 can be set at standard rates in the range 9,600 to 57,600 baud. The format used is 8 data bits, no parity, 2 stop bits.

CON J4	Ref.	Function
2	TXD	RS232 TXD
3	RXD	RS232 RXD
5	GND	Signal GND

RS485 – Both RS232 and RS485 are supported but only one can be used. Address bytes in the RS485 commands allow multiple units (30 axis max) to be controlled from a single host port

CON J8	Ref.	Function
1	RS485+	RS485 TX/RX A
2	GND	Signal GND
3	RS485-	RS485 TX/RX B

RS232/RS485 Terminal – Place the jumper on Pins 1 & 2 if you want to communicate via RS485 (and place a jumper on JP5 for the last board in the line). Place the jumper on Pins 2 & 3 if you are communicating on RS232.

CON J4	Ref.	Function
1	RS485	Use pins 1 & 2 for RS485
2	Comm.	
3	RS232	Use pins 2 & 3 for RS232

Opto-Isolators – Provision is made to accept Step and Direction inputs via standard opto-isolators. Requires 10 to 15 mA from a +5 VDC supply for each input

CON JP3	Ref.	Function
15	OI1G	Opto-Isolator 1 Ground
16	OI1S	Opto-Isolator 1 Signal
17	OI2G	Opto-Isolator 2 Ground
18	OI2S	Opto-Isolator 2 Signal
19	GND	Signal GND
20	FLT	Fault

Limit Switches – The limit switch inputs can be from mechanical switches (Contact closure to ground with 10K pull-ups) or from optical or magnetic sensors with logic level outputs

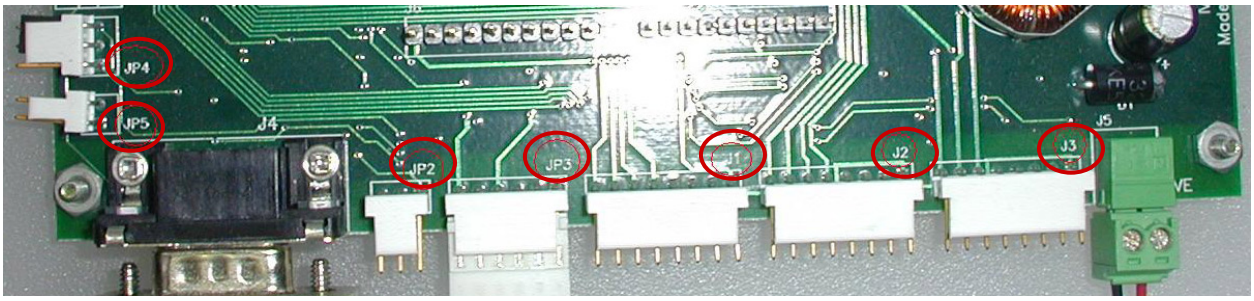
CON J1	Ref.	Function
1	AVCC	+5VDC
2	RS1	Right Switch 1*
3	LS1	Left Switch 1*
4	GND	Ground
5	M1B-	Motor 1 Phase B -
6	M1A-	Motor 1 Phase A -
7	M1B+	Motor 1 Phase B +
8	M1A+	Motor 1 Phase A +

CON J2	Ref.	Function
1	AVCC	+5VDC
2	RS2	Right Switch 2*
3	LS2	Left Switch 2*
4	GND	Ground
5	M2B-	Motor 2 Phase B -
6	M2A-	Motor 2 Phase A -
7	M2B+	Motor 2 Phase B +
8	M2A+	Motor 2 Phase A +

CON J3	Ref.	Function
1	AVCC	+5VDC
2	RS3	Right Switch 3*
3	LS3	Left Switch 3*
4	GND	Ground
5	M3B-	Motor 3 Phase B -
6	M3A-	Motor 3 Phase A -
7	M3B+	Motor 3 Phase B +
8	M3A+	Motor 3 Phase A +

***NOTE:** In order to first get the R364 running, all limit switches must be timed to ground. On all 3 axes, tie pins 2, 3, and 4 together.

Location of Pin1
The location of pin 1 is always where the silkscreen label is located. Follow image below:



7. INPUTS & OUTPUTS

Analog VCC – A filtered output from the on-board voltage regulator (0.5 mA max).

Analog Inputs – Voltage signals in the range 0 to 5 VDC can be read via the microcontroller 10 bit ADC, or these pins can be set for logic signal input by user software

CON J6	Ref.	Function
1	AVCC	Analog VCC (+5v Ref)
2	GND	Ground
3	ADC0	Analog In 0 (Or TTL Logic In)
4	ADC1	Analog In 1 (Or TTL Logic In)
5	ADC2	Analog In 2 (Or TTL Logic In)
6	ADC3	Analog In 3 (Or TTL Logic In)
7	ADC4	Analog In 4 (Or TTL Logic In)
8	ADC5	Analog In 5 (Or TTL Logic In)
9	ADC6	Analog In 6 (Or TTL Logic In)
10	ADC7	Analog In 7 (Or TTL Logic In)

Logic VCC – A direct output from the on-board voltage regulator. Maximum current draw should be less than 150 mA

Digital Out – Logic level outputs under user software control

CON J7	Ref.	Function
1	VCC	Logic VCC
2	GND	Ground
3	OUT0	Digital Out 0
4	OUT1	Digital Out 1
5	OUT2	Digital Out 2
6	OUT3	Digital Out 3
7	OUT4	Digital Out 4
8	OUT5	Digital Out 5
9	OUT6	Digital Out 6
10	OUT7	Digital Out 7

8. CONNECTION SPECIFICATIONS

List of Parts:

- R364 3-Axis Controller/Driver
- RS232 Serial Cable (DB9, male to female cable) and Motor Cables
- PC
- Power supply +15 to 48 VDC
- 1-3 Bipolar 2-phase step motors

Follow the schematic for correct connection:

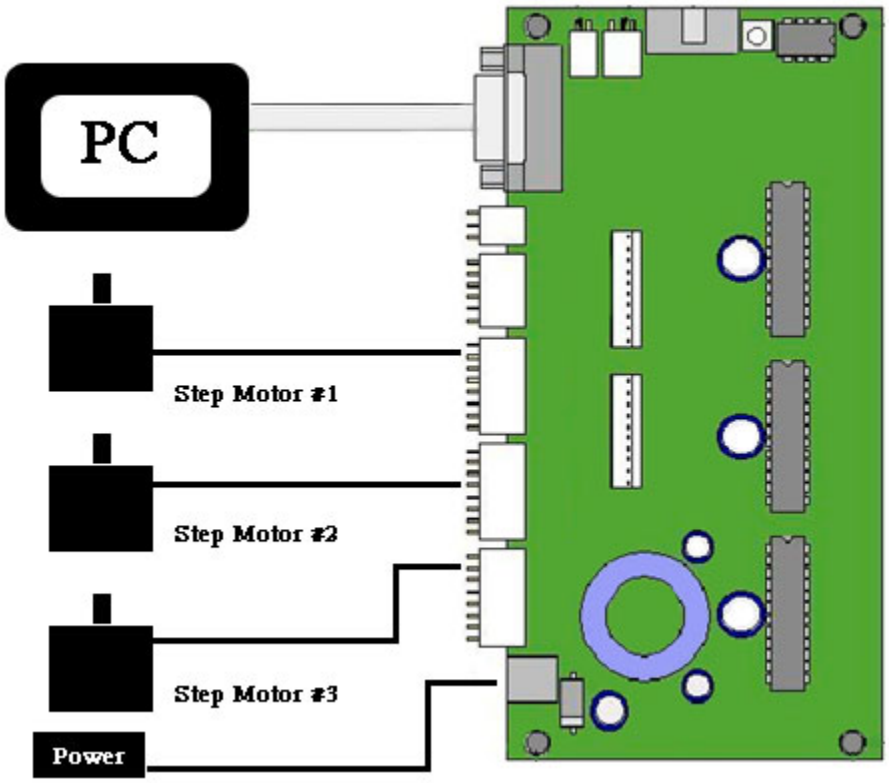


Figure 3: Connection Diagram

9. HYPERTERMINAL CONFIGURATION

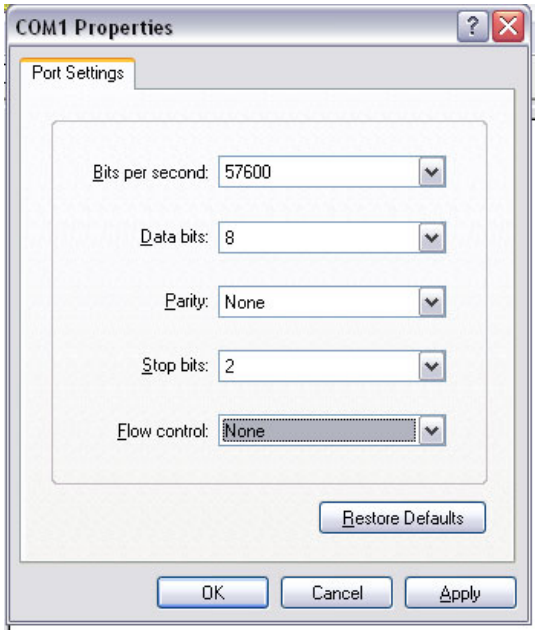
Using HyperTerminal to first get motors running; go to (Windows 98 or newer):
Start Menu → Programs → Accessories → Communications → HyperTerminal.

1. Name your new connection and select an icon.

Click 'OK'

2. Then select the correct connection that the R364 is connected to, i.e. COM1.

Click 'OK'



3. Select the correct settings:

Bits per second:	57600
Data bits:	8
Parity:	None
Stop Bits:	2
Flow Control:	None

Click ‘OK’

4. Now go to File → Properties

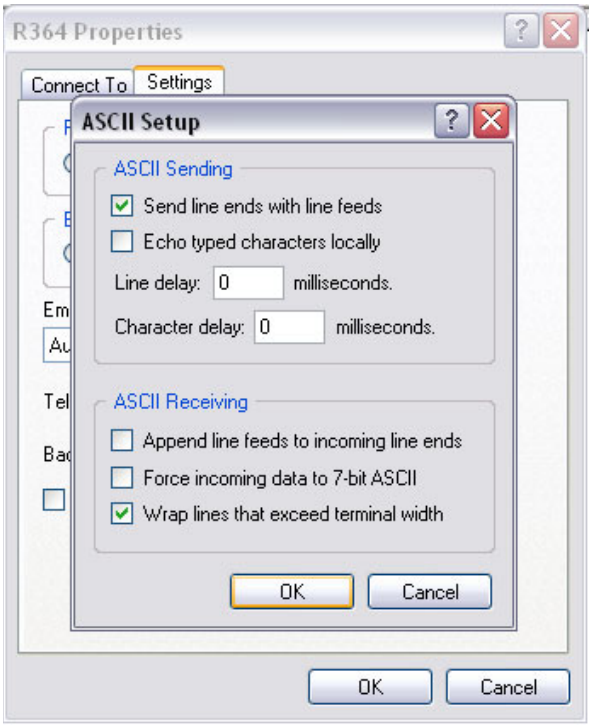
Click the ‘Settings’ tab.

Then click on ‘ASCII Setup’.

Check the ‘Send line ends with line feeds’ box. Click ‘OK’

Now, you are ready to program the R364 controller.

When finished using HyperTerminal, you can save your settings when prompted.



10. MULTIPLE R364 BOARDS

Multiple R364 modules can be controlled from a single computer port. Each module is assigned a unique address character, and the RS485 bus ports are wired in parallel.

The individual can be widely distributed (up to 500 ft) or stacked side by side.

RS232 to RS485 and USB to RS485 adapters are available from several sources.

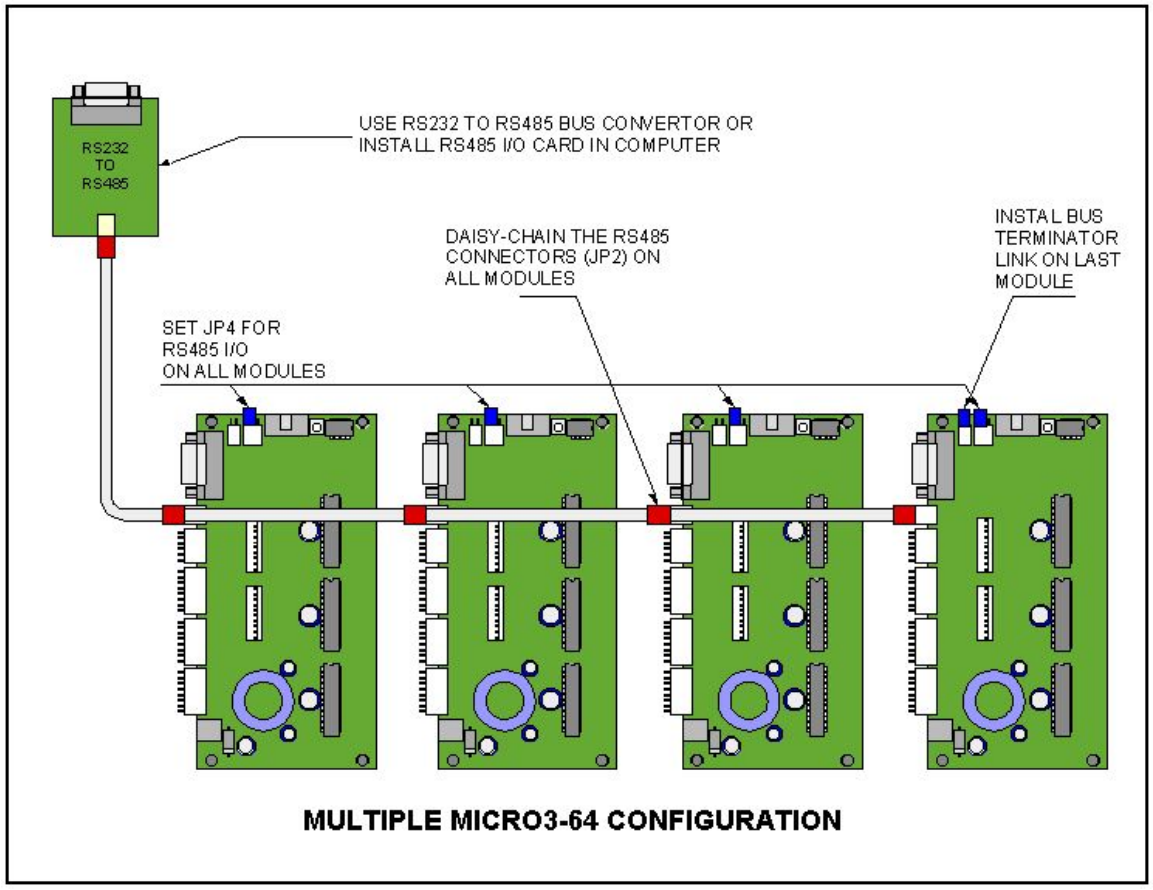


Figure 4: Multiple R364 Configuration Diagram

11. MOTOR CONNECTIONS

Step Motors have 4, 6, or 8 wires. To better understand how to connect your step motor with your R364 Driver, follow the Figures below for the corresponding motor. NOTE: The dots indicate the starting position of the wires when wound.

4 Lead Wire Motor Connection
Connect one set of windings to the A terminals. Connect the other set of windings to the B terminals. If the set of windings is unclear, take a pair of wires; use an ohmmeter to check for continuity. When you find the first two wires that have continuity, connect it to the A terminals. Connect the other two to the B terminals.

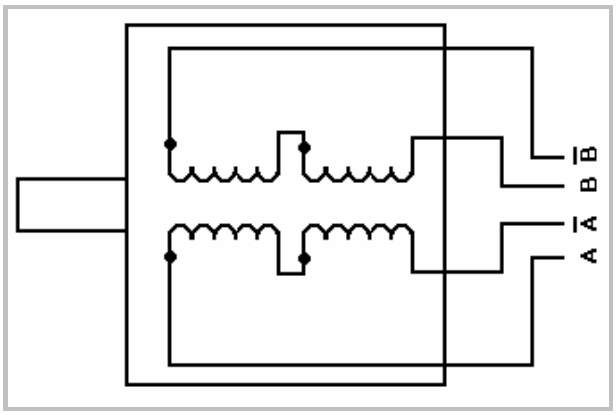


Figure 8.1: 4 Lead Wire Motor Connection

6 Lead Wire Motor Connection (Half Winding)
Six wire motors can be wound in two ways: Half Winding and Full Winding. Six wire motors contain a center tap on each of the two windings. For a half-winding connection, the center tap and one end of the wires are used. (Also called Half-coil)

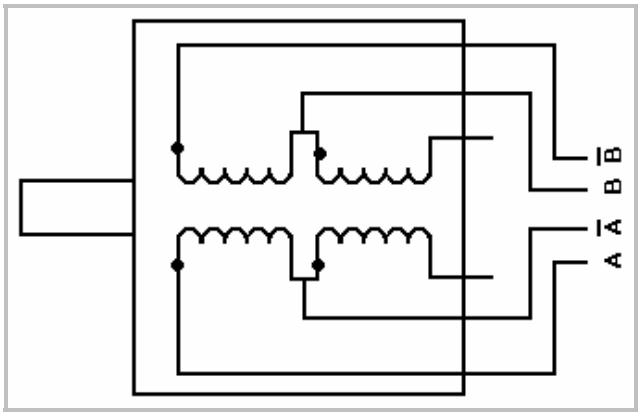


Figure 8.2: 6 Lead Wire Half Winding Connection

6 Lead Wire Motor Connection (Full-Winding)

For a full winding connection, use both end wires, the center tap is ignored. (NC: No Connection). Also known as series connection.

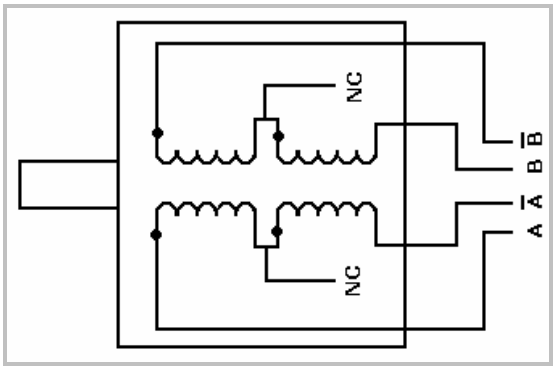


Figure 8.3: 6 Lead Wire Full Winding Connection

8 Lead Wire Motor Connection (Parallel Connection)

Eight wire motors can be connected in two ways: Parallel and Series. When in parallel, the wires are simply connected such that the beginning of each winding are connected together.

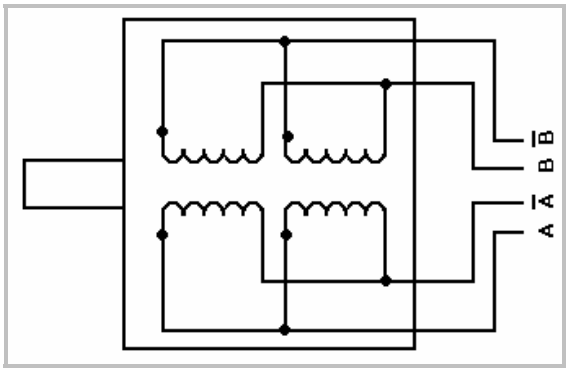


Figure 8.4: 8 Lead Wire Parallel Connection

8 Lead Wire Motor Connection (Series Connection)

Be sure to set the drive current to exactly half of the motor's rated parallel current rating when using the series connection.

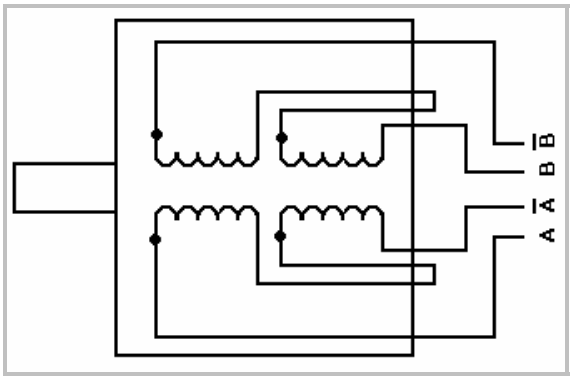


Figure 8.5: 8 Lead Wire Series Connection

12. TROUBLESHOOTING

Why aren't my motors spinning?
Make sure that if you are not using the reference switches that you have them tied to ground.